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ABSTRACT

This investigation of the use of white space in print-based, computer-generated text focused on the point at which the white space interferes with reading speed and comprehension. It was hypothesized that reading speed and comprehension would be significantly greater when text was wrapped tightly around the graphic than when it had one-half inch of white space surrounding it. The subjects were 128 undergraduate students from an introductory computer literacy course, and the readings included approximately six pages of informative text about HyperCard and desktop publishing. Three sets of reading materials were used, all of which included the same text arranged in a single column format. Set one, which contained no graphic, was used with the control group. Sets two and three contained 12 identical graphics with wrap-around text, but set two had no white space between the text and the graphic, and set three had one-half inch of white space. A pretest was administered before the three sets of reading materials were randomly distributed to the students, who were instructed to read through the text one time without hurrying. The time was recorded, and the posttest was given immediately. Since analysis of variance (ANOVA) showed no significant differences in the mean pretest scores of the three treatment groups, ANOVA was also conducted on the posttest score to measure differences in comprehension and speed. Significant differences in comprehension were found between the groups, with group three (one-half inch of white space) comprehending significantly less than the subjects in groups one and two. There were no significant differences in reading speed among the three groups. Figures illustrating different types of formats for incorporating graphics in text are appended. (28 references) (BBM)

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A Fine-Tuned Look at White Space Variation in Desktop Publishing

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Desktop publishing has revolutionized the publication industry. Layout programs permit designers to choose various layout styles; place text and graphics within pages; decide on fonts, hyphenation, justification; and select color separations. Three of the most popular programs, QuarkXPress, Pagemaker , and Ready, Set Go! accept styling information from imported manuscripts and allow an author to write using character formatting, kerning, bold-face, italic, fonts, and line-break information. Clip art, photographs, technical illustrations, and so forth can be inserted into a variety of text formats. Three sophisticated computerized text formats which have been made available recently to consumers, and are used to market the desktop publishing software, include run-around text, wrap-around text, and transparent text.

Run-around text is boxed around the graphic and has straight borders (see Figure 1). Wrap-around text conforms to the shape of the graphic and has irregular borders (see Figure 2.) And, transparent text is that which has a graphic placed directly over the text (see Figure 3). In all three of the top programs, the software allows the user to place text over a graphic and vice versa. It also allows the user to run text around a rectangular graphic box, run text around the outline of a graphic, or run text behind a graphic box. Examples of all three formats can be found in consumer magazines, newspapers, and instructional materials.

[Insert Figures 1, 2, and 3 about here.]

As a result of new publishing enhancements, people with little publishing experience are now making decisions involving the flow of text on pages, placement of graphics within text, and text wrap-around or run-around features. Such decisions, often made with no guiding principles in mind, affect both reading speed and comprehension (Knupfer & McIsaac, 1989a). In many cases, inappropriate selections are being made which adversely affect readability. If we can examine the effects of many of these page-layout enhancements and develop principles for their effective use, perhaps these design choices can become more educationally sound. The amount of white space surrounding a graphic (Knupfer & McIsaac, 1990a) may well be one of those variables which can be manipulated to enhance understanding of the text .

BACKGROUND

Text variables and graphic design have received attention in four basic areas of research: graphic design, instructional text design, instructional graphics, and, in recent years, computer design of materials for on-screen or printed material.

Research on graphic design emphasizes the importance of balancing text with white space, improving the aesthetics of the page, and positioning graphics as the dominant visual element (Parker, 1987). Such research does not usually question the content of the graphic. And, research in the area of reading indicates that the

type of graphic is an important variable in reading comprehension, but that most students don't attend to the graphics (Reinking, 1986). Simple graphics at the pictorial level might not make a difference in reading speed or comprehension, but graphics which are designed at the inferential, generalized, and evaluative levels of understanding can help students grasp the meaning of the text (Reinking, 1986; Singer & Donlan, 1980). Further, research on learning suggests that designers should address cognitive processes by developing materials for graphic thinkers, not just graphic readers (Boyle, 1986).

Recently, principles for text design have been developed for use by instructional designers (Hartley, 1985; Heines, 1984; Jonassen, 1982). Layout is one variable which significantly affects readers' speed and comprehension. But the layout variables in text research (type style, upper-lower case, character attributes, line length, and justification) do not address the question of graphic content or placement. There is a dearth of reported research on graphic placement in instructional text which can influence guidelines for the emerging capabilities of new computer software programs (Isaacs, 1987; Knupfer & McIsaac, 1990a).

Instructional graphics research reveals no empirical evidence that the use of graphics in instruction improves learning, but the graphics used in that research might have represented concepts already familiar to the readers (Merrill & Bunderson, 1981). More sophisticated instructional graphics, such as pictorial, symbolic, schematic, or figurative displays, can be effective in teaching, and the visualization of abstract ideas through figurative displays may very well enhance learning (Nygard & Ranganathan, 1983).

Research that compared reading comprehension using computer screen versus printed text revealed nonsignificant differences (Gambrell, Bradley, & McLaughlin, 1987). Despite the similar result concerning comprehension, students reported more difficulty reading from the computer screen than from printed text; one variable which caused this difficulty was fatigue (Hathaway, 1984; Mourant, Lakshmanan, & Chantadisai, 1981). Even though research on electronic and printed-based materials have their own specific variables, certain features apply to both, including text density, upper- and lower-case, and typographic cueing (Hartley, 1987; Hathaway, 1984; Morrison, Ross, & O'Dell, 1988; Ross, Morrison, & O'Dell, 1988).

Several researchers have investigated layout, typographic cueing, and representation of graphic material in print-based text. Hartley (1985) determined that page size affects other layout decisions. Some studies that have compared the effects of justified and unjustified text on reading speed and comprehension found no significant differences (Campbell, Marchetti, & Mewhort, 1981; Muncer, Gorman, Gorman, & Bibel, 1986), yet the issue remains unresolved (Jonassen, 1982). Jandreau, Muncer, and Bever (1986) have investigated the effects of varying spaces between phrases in sentences. Still others have examined certain design features common to printed and electronic text in the presentation of graphic materials (Alesandrini, 1987; Poggenpohl,1985; Winn,1987; Winn & Holliday, 1982). Hartley (1987) and others have requested that such research be done.

Knupfer and McIsaac (1990a, 1990b, 1989a, 1989b) investigated the effects of various wrap-around enhancements which were produced electronically for print-based materials. They found that the wrap-around text placement produces faster reading time and better comprehension than the run-around text placement (1989a). Further, when comparing the use of the wrap-around text format, with variations in

the amount of white space between the graphic and the text, they found a trend but no significant differences in reading speed or comprehension between text that was placed very close to the graphic and text that was placed further away from the graphic, showing 1/4 inch of white space (1990a).

Although certain features of electronic text can be transferred to printed text, there are many differences between the two which suggest that separate studies be done. The size of the screen or page, the type size and the ability to scroll are but a few of the differences which affect print and electronic text comparison studies. Because of these differences, a programmatic series of investigations is needed to examine the effects of these recent technological enhancements in each of the two media formats. Recent work by Morrison, Ross, and O'Dell (1988) examines attributes of computer based instruction, and attempts to affect these attributes by regulating text density for print and screen display lessons. Results suggested that print had more advantages than the computer screen in achievement, completion time, and learning efficiency for a statistics lesson. Therefore, the present study is limited to the examination of print-based, computer-generated text.

PURPOSE

Graphic designers have long emphasized the importance of using white space for balancing text, positioning graphics, and improving the aesthetics of the page layout (Parker, 1987). However, few attempts have been made to examine how the shape and amount of white space between the graphic and text enhances the visual without adversely affecting comprehension of the reading material.

The purpose of this study was to investigate previously noted trends (Knupfer & McIsaac, 1990a, 1990b, 1989a, 1989b) in order to discover the point at which the white space interferes with reading speed and comprehension. This study utilized only the wrap-around text format and compared the effects of variations in white space surrounding the graphic. Wrap-around text with no white space around the graphic (see Figure 2) was compared to wrap-around text with one-half inch of white space between the graphic and text (see Figure 4). A third group which contained no graphic at all was used as a control (see Figure 5).

[Insert Figures 4 and 5 about here.]

Based on the principles of perceptual organization, which include similarity, proximity, continuity, and closure (Bloomer, 1976) we speculated that the amount of white space surrounding the graphic would affect reading reading speed and comprehension. These four processes, by which the mind organizes meaning, depend on how physically close the objects are, how similar they are, whether there is a continuous line to guide the eye, and whether the minimal amount of information is present that is necessary to obtain meaning or closure. Reading speed and comprehension are directly affected by the way the mind organizes meaning from the placement of graphics and text. In particular, the principle of proximity states that the closer two or more visual elements are, the greater is the probability that they will be seen as a group or a pattern. Further, the critical nature of horizontal space between visual elements influences the interpretation of the meaning of those elements (Zakia, 1975). Based upon this information, this study tested the hypothesis that reading speed and comprehension would be significantly greater when text was wrapped tightly around the graphic than when it had one-half inch of white space surrounding it.

METHOD

Subjects

One hundred, twenty-eight students from an introductory computer literacy course at a major university in the Southwest participated in this study. The elective course was an upper division course which was offered to meet a General Studies numeracy requirement. Students were sophomores, juniors, and seniors who had very little or no prior computer experience. This study was conducted at the beginning of the semester before the students encountered the information presented in the textual material. All students in the course participated in the study.

Materials

Readings. Readings included approximately six pages of informative text about Hypercard and desktop publishing. These materials were chosen because the topic was relevant to the subjects and because the reading level was geared for the general public as opposed to technical readers. The topic was suited to a novice audience with no prior knowledge about either Hypercard or desktop publishing. The text was analyzed using the Flesch-Kincaid Readability formula and was found suitable for college students between the 11th and 13th grade levels.

Three sets of reading materials were used for this study. All included the same text arranged in single column format. Set one did not contain any graphics at all. Sets two and three each contained 12 identical graphics which were placed in the text using the wrap-around technique. The only difference between sets two and three was the amount of white space surrounding the graphics. Set two had no white space between the graphics and text, while set three had one-half inch of white space between the graphics and text. The simple, pictorial graphics were meant to be motivational and were linked to the text by interest. Even though they were not critical for the understanding of the textual material, the graphics very well could have promoted understanding through illustrative associations.

In the hypercard article, the graphics included a Macintosh computer with a set of linked cards on the screen corresponding to an introductory paragraph describing hypercard and the machinery it runs on, a stack of index cards representing Hypercard's index card analogy, a set of books representing computer manuals, an organizational chart representing the five levels of hypercard application, an educator sitting at a computer representing Hypercard's impact on education, a teacher and an administrator discussing the potential of Hypercard in schools, a set of computer disks representing Hypercard's impact on new software development, and finally, a newsletter and newspaper set representing the important evolutionary step in computing attributed to Hypercard. The desktop publishing article displayed a desk to represent the desktop publishing concept, a hand on a mouse where the text explains that various desktop publishing programs support mouse usage, and a set of black and white tack pins representing the concept of the same yet different, to coincide with the text's explanation concerning variations in the same desktop publishing software to accommodate the MS-DOS and Macintosh environments.

Although some professional layout designers might question the graphics placement within these reading materials in terms of the elements of good design, it is important to know that the way in which the materials were developed is indicative

of common practice among lay people. Therefore, any flaws in the materials design are potential problems that other teachers and trainers might exhibit as well.

Pretest and Posttest. To measure the students' comprehension of the reading material, a pretest and a posttest were developed from key concepts which the authors extracted from the readings. No test items were dependent upon the information contained in the graphics. The tests were developed and validated during a previous phase of the project, and were found to be reliable at the .76 level using the KR20 formula. The pretest and posttest were nearly identical; each contained the same 34 multiple choice and 11 completion questions utilizing the fill-in-the-blank format. The two types of questions measured both recognition and recall comprehension skills. In addition to those questions, the two groups with graphics were asked to recall as many graphics as possible on the posttest. They were told that there were 12 graphics to recall.

Procedure

All subjects were given a pretest to determine their knowledge of the subject prior to reading. There was no time limit and students were free to take the time they needed to complete the test. Next, the three sets of reading materials were randomly distributed to the students so that each student received one set of articles. Students were instructed to read through the text one time without hurrying. When subjects were finished reading, each of them recorded their time from a master timekeeper which posted times to the half second. Proctors observed the students to make sure that their times were recorded correctly. Immediately following the reading, the subjects were given the posttest. They were allowed as much time as they needed to complete the test.

Analysis

Even though the treatment groups were randomly chosen, there were slight variations in the mean pretest scores which had potential influence on the remaining statistical analysis. To determine appropriate statistical tests, analysis of variance (ANOVA) was conducted on the pretest scores for the three groups to determine if there were any significant differences in the groups prior to treatment. Independent variables were the text-graphic format (no graphics, wrap-around text with no white space, and wrap-around text with one-half inch of white space). The dependent variables included reading speed and comprehension. Since there were no significant differences in mean pretest scores for the three treatment groups (see Table 1), ANOVA was also conducted on the posttest scores to measure differences in comprehension. ANOVA was also conducted on the reading speed for the three groups. Additionally, a t-test was conducted on the graphic recall question for groups two and three, the two groups which had graphics. For all statistical testing, the alpha level for significance was set at .05.

TABLE 1
Summary of ANOVA
Pretest Comprehension by Format

Source	D.F.	Sum of Sq.	Mean Sq.	F Ratio	F Prob.
Between Groups	2	69.23	34.61	.84	.43*
Within Groups	125	5162.65	41.30		
Total	127	5231.88			

Not significant at the .05 level

RESULTS AND CONCLUSIONS

Significant differences in comprehension were found between the groups. Subjects in group three, with one-half inch of white space between the graphic and text, comprehended significantly less than subjects in group one and group two; groups one had no graphics and group two had no white space between the graphic and text. There were no significant differences in reading speed between the three groups. Mean scores and standard deviations for the pretest, posttest, and reading speed for each of the treatment groups are shown in Table 2. Table 3 shows results of the ANOVA conducted on reading speed and Table 4 reports the ANOVA for posttest comprehension between treatment groups.

TABLE 2
Reading Pretest, Posttest, and Reading Speed in Minutes
Means and Standard Deviations

		Pretest		Posttest		Minutes	
Group	n	M	SD	M	SD	M	SD
No Graphic	44	7.09	6.15	40.14	12.08	9.86	1.98
Wrap Tight	44	6.04	5.79	38.23	15.17	10.54	1.98
Wrap 1/2" White	40	7.85	7.32	32.25	12.32	10.27	2.24

TABLE 3
Summary of ANOVA
Reading Speed by Format

Source	D.F.	Sum of Sq.	Mean Sq.	F Ratio	F Prob.
Between Groups	2	10.36	5.18	1.21	.30*
Within Groups	125	534.57	4.28		
Total	127	544.93			

Not significant at the .05 level

TABLE 4
Summary of ANOVA
Posttest Comprehension by Format

Source	D.F.	Sum of Sq.	Mean Sq.	F Ratio	F Prob.
Between Groups	2	1401.56	700.78	3.96	.02*
Within Groups	125	22094.41	176.76		
Total	127	23495.97			

Significant at the .05 level

We venture to guess that the lower mean comprehension score on for group three reflects the principal of visual perception called proximity; it is more difficult for the eye to follow the text and perceive meaning due the larger gaps that the eye must jump across to continue reading. Further, it agrees with Zakia's (1975) claim that the horizontal spacing is critical to accurate perception.

Table 5 shows results of the t-test between groups two and three concerning recall of the 12 graphics. There were no significant differences between the two groups based upon the amount of white space surrounding the graphic. The low mean scores indicate that neither group remembered very many of the graphics. This, along with similar reading speed between the groups, supports Reinking's claim that readers do not really pay attention to pictorial graphics (1986).

TABLE 5
T-Test
Graphics Recall by Format

Group	n	Mean	SD	SE	F Value	2-Tail Prob.
Wrap Tight	44	1.27	1.66	0.25	1.17	0.61*
Wrap 1/2" White	40	1.57	1.53	0.24		

Not significant at the .05 level

Based upon the findings of this research and our past research on this topic (Knupfer & McIsaac, 1990a, 1990b, 1989a, 1989b), we recommend that people who place graphics within text using desktop publishing software either use no graphics at all or use graphics which use the wrap-around text as opposed to the run-around, boxed style of text wrap. Further, when using the wrap-around text format, limit the white space between the graphic and text to less than one-half inch.

It is possible that reading speed and comprehension using these text-wrap configurations could vary dependent upon the type of graphic used. Therefore, we suggest that future research be conducted using a variety of graphics, including those which are more critical to the meaning of the text.

REFERENCES

Alesandrini, K.L. (1987). Computer graphics in learning and instruction. In H.A. Houghton and D.M. Willows (Eds.), *The psychology of illustration: Vol 2: Instructional issues*, New York: Springer Verlag.

Bloomer, C.M. (1976). *Principles of Visual Perception.* New York: Reinhold.

Boyle, M.W. (1986). Hemispheric Laterality as a Basis of Learning: What We Know and Don't Know. In G.D. Phye and T. Andre (Eds.), *Cognitive Classroom Learning: Understanding , Thinking, and Problem Solving.* San Diego, CA: Academic Press, Inc.

Campbell, A.J., Marchetti, F.M., & Mewhort, D.J.K. (1981). Reading speed and text production: A note on right-justification techniques. *Ergonomics*, 24, 611-622.

Gambrell, L.B., Bradley, V.N., & McLaughlin, E.M. (1987). Young Children's Comprehension and Recall of Computer Screen Displayed Text. Journal of Research in Reading, 10(2), 156-163.

Hathaway, M.D. (1984, January). Variables of Computer Screen Display and How they Affect Learning. *Educational Technology*, 7-11.

Hartley, J. (1987). Designing electronic text: The role of print-based research. *Educational Communication and Technology*, 35(1), 3-17.

Hartley, J. (1985). *Designing instructional text* (2nd ed.). New York: Nichols.

Heines, J. (1984). *Screen Design Strategies for Computer Assisted Instruction.* Bedford, MA: Digital Press.

Jandreau, S.M., Muncer, S.J., & Bever, T.G. (1986). Improving the readability of text with automatic phrase-sensitive formatting. *British Journal of Educational Technology*, 17(2), 128-133.

Jonassen, D.H. (1982). *The Technology of Text.* Englewood Cliffs, NJ: Educational Technology Publications.

Knupfer, N.N., & McIsaac, M.S. (1990). The Effects of Varying White Space Around Graphics Within Text. *Journal of Visual Literacy.* 10(1), 63-74.

Knupfer, N.N., & McIsaac, M.S. (1990). Visual Discrimination, Learning, and Page Layout: Wrap-Around, Run-Around, and Transparent Text. *Proceedings of the annual conference of the Association of Educational Communications and Technology* (AECT), Anaheim, CA. Jan. 30 - Feb. 4.

Knupfer, N.N., & McIsaac, M.S. (1989). Desktop Publishing: The Effects of Computerized Formats on Reading Speed and Comprehension. *Journal of Research on Computing in Education.* 22(2), 127-136).

Knupfer, N.N., & McIsaac, M.S. (1989). White Space, Graphics, and Text.. *Proceedings of the 21st Annual Conference of the International Visual Literacy Association* (IVLA). Scottsdale, AZ. Oct. 1989.

Merrill, P.F., & Bunderson, C.V. (1981). Preliminary Guidelines for Employing Graphics in Instruction. *Journal of Instructional Development*, 4(4), 1-9.

Morrison, G.R., Ross, S.M., & O'Dell, J.K. (1988). Text density Level as a Design Variable in Instructional Displays. *Educational Communication and Technology*, 36(1), 103-115.

Mourant, S.J., Lakshmanan, R., & Chantadisai, R. (1981). Visual Fatigue and Cathode Ray Tube Display Terminals. *Human Factors*, 23, 529-540.

Muncer, S.J., Gorman, B.S., Gorman, S., & Bibel, D. (1986). Right is Wrong: An Examination of the Effect of Right Justification on Reading. *British Journal of Educational Technology*, 17(1), 5-10.

Nygard, K.E., & Ranganathan, B. (1983, Spring). A System for Generating Instructional Computer Graphics. *AEDS Journal*, 16(3), 177-187.

Parker, R.C. (1987). *The Aldus guide to basic design.* Seattle: Aldus Corporation.

Poggenpohl, S. (Ed.) (1985). Graphic design: Computer graphics [Special issue]. *Visible Language*, XIX(2), 173-306.

Reinking, D. (1986). Integrating Graphic Aids into Content Area Instruction: The Graphic Information Lesson. *Journal of Reading*, 30(2), 146-151.

Ross, S.M., Morrison, G.R., & O'Dell, J.K. (1988). Obtaining more out of less text in CBI: Effects of varied text density levels as a function of learner characteristics and control strategy. *Educational Communications and Technology Journal*, 36(3), 131-142.

Singer, H., & Donlan, D. (1980). *Reading and Learning from Text.* Boston: Little, Brown.

Winn, W. (1987). Using charts, graphs and diagrams in educational materials. In D. M. Willows and H.A. Houghton (Eds.) *The psychology of illustration: Vol.1. Basic Research.* New York: Springer Verlag.

Winn, W.D., & Holliday, W.G. (1982). Design principles for diagrams and charts,In D.H. Jonassen (Ed.), *The technology of text.* Englewood Cliffs, NJ: Educational Technology Publications.

Zakia, R.D. (1975). *Perception and Photography.* Englewood Cliffs, NJ: Prentice Hall.

FIGURE 1
Run-around Text

In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.

FIGURE 2
Wrap-around Text

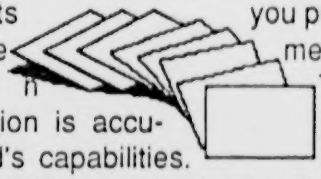
In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets  you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.

FIGURE 3
Transparent Text

In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.

FIGURE 4
Wrap-around Text with One-Half Inch White Space

In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you can manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.

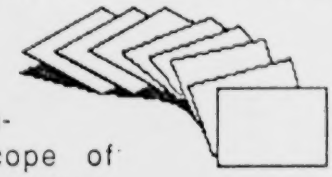


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FIGURE 5
Text with No Graphic

In 26 words or less, HyperCard is "an innovative data handling environment. HyperCard lets you put information in stacks of index cards, then easily link elements of the data in amazingly complex ways" (Keith Thompson, *InfoWorld*, October 5, 1987). This brief description is accurate, but does not begin to explore the scope of HyperCard's capabilities. For example, the data that you manipulate can be text, graphics, synthesized or digitized speech, or the contents of a CD-ROM or videodisc. You can gain access to these data with the click of a mouse button, and you can move through millions of bytes of information in a matter of seconds. And unlike other traditional databases, HyperCard does not restrict you to linear-sequential organization. You can bound through your data in any way your heart desires by clicking on predetermined text, graphics, or buttons.